

## GC/MS BATCH NUMBER: SB5100

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**ESSENTIAL OIL:** SEA FENNEL  
**BOTANICAL NAME:** CRITHMUM MARITIMUM  
**ORIGIN:** GREECE

KEY CONSTITUENTS PRESENT IN THIS BATCH OF SEA FENNEL OIL	%
γ-TERPINENE	26.3
LIMONENE	20.3
SABINENE	16.2
1,8-CINEOLE	12.5
(Z)-β-OCIMENE	5.7
p-CYMENE	4.7
TERPINEN-4-OL	2.9
DILL APIOLE	1.7
MYRCENE	1.6
THYMOL METHYL ETHER	1.6
α-PINENE	1.5

Comments from Robert Tisserand: Fresh, green, hay-like odor quality with hints of Tea Tree, Fennel and Nutmeg. Constituents are in expected amounts.

**Date :** May 28, 2018

**CERTIFICATE OF ANALYSIS – GC PROFILING**

**SAMPLE IDENTIFICATION**

**Internal code :** 18E25-PTH1-1-CC

**Customer identification :** Sea Fennel - Greece - SB510079R

**Type :** Essential oil

**Source :** *Crithmum maritimum*

**Customer :** Plant Therapy

**ANALYSIS**

**Method:** PC-PA-014-17J19 - Analysis of the composition of an essential oil, or other volatile liquid, by FAST GC-FID (in French); identifications validated by GC-MS.

**Analyst :** Benoit Roger, Ph. D.

**Analysis date :** May 25, 2018

Checked and approved by :

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Alexis St-Gelais, M. Sc., chimiste 2013-174

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*This report is digitally signed, it is only considered valid if the digital signature is intact.*

*PHYSICOCHEMICAL DATA*

**Refractive index:**  $1.4768 \pm 0.0003$  (20 °C)

*CONCLUSION*

No adulterant, contaminant or diluent has been detected using this method.

## ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
$\alpha$ -Isoamylène	0.06		Alkene
$\alpha$ -Thujène	0.47	0.47	Monoterpène
$\alpha$ -Pinène	1.46	1.46	Monoterpène
Camphène	0.05	0.05	Monoterpène
$\beta$ -Pinène	16.33*	0.18	Monoterpène
Sabinène	[16.33]*	16.18	Monoterpène
Myrcène	1.64	1.64	Monoterpène
$\alpha$ -Phellandrene	0.47*	0.40	Monoterpène
Pseudolimonène	[0.47]*	0.07	Monoterpène
$\Delta^3$ -Carene	0.04	0.04	Monoterpène
$\alpha$ -Terpinène	0.98	0.99	Monoterpène
para-Cymène	4.67	4.71	Monoterpène
Limonène	32.90*	20.34	Monoterpène
1,8-Cineole	[32.90]*	12.53	Monoterpenic ether
(Z)- $\beta$ -Ocimène	5.65	32.04	Monoterpène
(E)- $\beta$ -Ocimène	0.35	0.36	Monoterpène
$\gamma$ -Terpinène	26.32	[32.04]	Monoterpène
cis-Sabinène hydrate	0.06	0.06	Monoterpenic alcohol
$\alpha$ -Pinène oxide analog	0.01	0.01	Monoterpenic ether
Terpinolène	0.45*	0.44	Monoterpène
para-Cymenène	[0.45]*	0.01	Monoterpène
trans-Sabinène hydrate	0.04	0.04	Monoterpenic alcohol
Linalool	0.08	0.08	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.09	0.09	Monoterpenic alcohol
allo-Ocimène	0.09*	0.08	Monoterpène
cis-Limonène oxide	[0.09]*	0.01	Monoterpenic ether
cis-para-Mentha-2,8-dien-1-ol	0.01	0.01	Monoterpenic alcohol
trans-Limonène oxide	0.02	0.01	Monoterpenic ether
trans-para-Menth-2-en-1-ol	0.06	0.05	Monoterpenic alcohol
Epoxyterpinolène	0.01	0.01	Monoterpenic ether
1,4-Dimethyl-4-acetylcyclohexène	0.01	0.01	Monoterpenic ketone
Terpinen-4-ol	2.88	2.86*	Monoterpenic alcohol
Cryptone	0.06	0.06	Normoterpenic ketone
$\alpha$ -Terpineol	0.15	0.19*	Monoterpenic alcohol
cis-Piperitol	0.04	0.02	Monoterpenic alcohol
$\alpha$ -Phellandrene epoxide	0.01	0.01	Monoterpenic ether
trans-Piperitol	0.04	0.05	Monoterpenic alcohol
trans-Carveol	0.02*	0.01	Monoterpenic alcohol
Unknown	[0.02]*		Unknown
Thymol methyl ether analog I	0.11	0.11	Monoterpenic ether
Thymol methyl ether	1.55	1.54	Monoterpenic ether
Carvacrol methyl ether	0.04	[2.86]*	Monoterpenic ether
Unknown	0.01		Unknown
(2E)-Decenal	0.01	0.01	Aliphatic aldehyde
Geranial	0.03	0.04	Monoterpenic aldehyde
Bornyl acetate	0.03	0.03	Monoterpenic ester
cis-Ascaridole glycol?	0.02	0.01	Monoterpenic alcohol
Cuminol	0.01	0.01	Monoterpenic alcohol

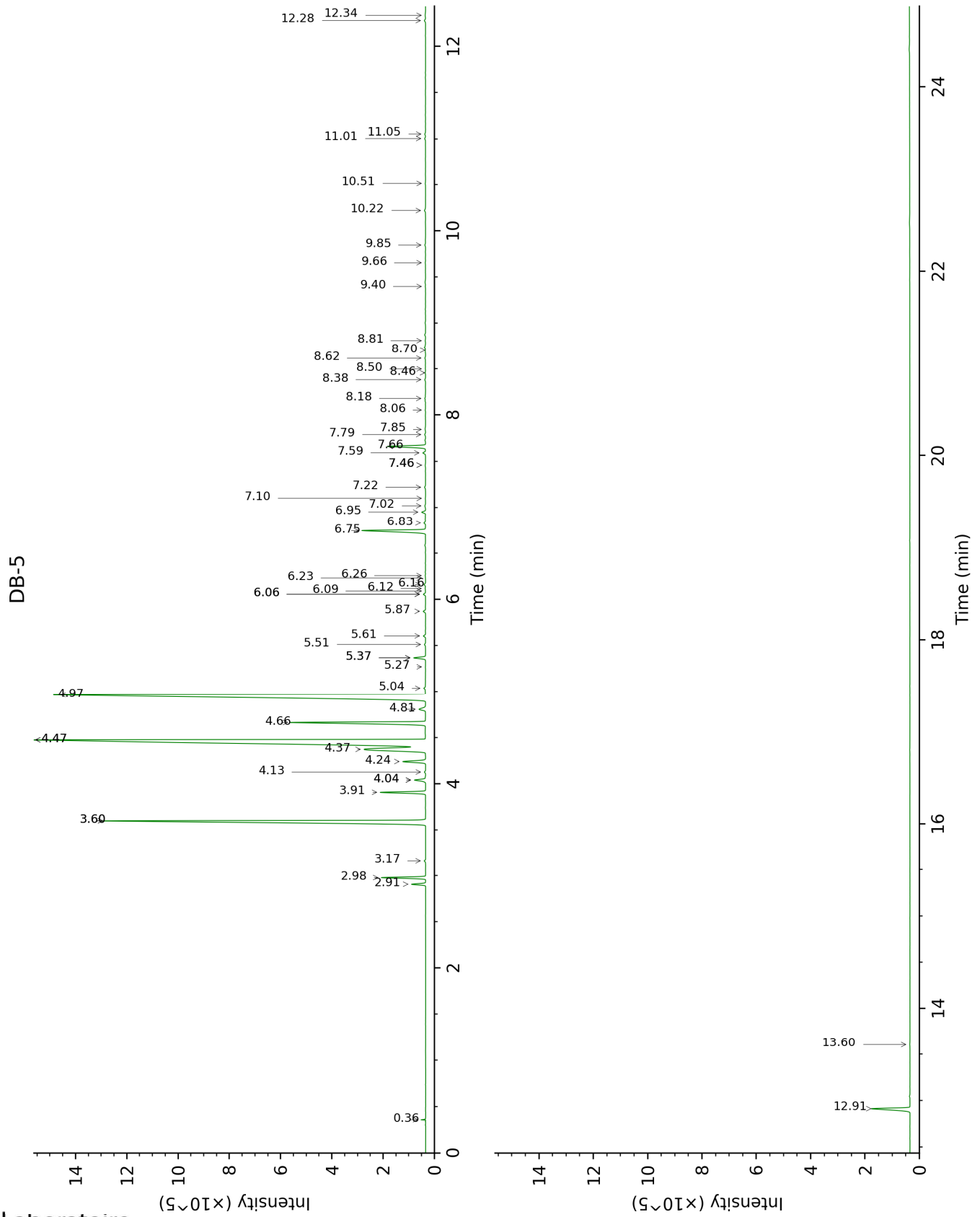
Thymol	0.03	0.04	Monoterpenic alcohol
Unknown	0.02		Unknown
Carvacrol	0.02	0.02	Monoterpenic alcohol
Unknown	0.01		Unknown
Unknown	0.01		Unknown
Unknown	0.04		Unknown
$\beta$ -Caryophyllene	0.05	0.04	Sesquiterpene
Aromadendrene	0.01	[2.86]*	Sesquiterpene
$\gamma$ -Muurolene	0.04	0.02	Sesquiterpene
Germacrene D	0.04	[0.19]*	Sesquiterpene
Spathulenol	0.05	0.06	Sesquiterpenic alcohol
Caryophyllene oxide	0.03	0.01	Sesquiterpenic ether
Dill apiole	1.74	1.73	Phenylpropanoid
Germacra-4(15),5,10(14)-trien-1 $\alpha$ -ol	0.01	0.01	Sesquiterpenic alcohol
<b>Total identified</b>	<b>99.32%</b>	<b>99.23%</b>	

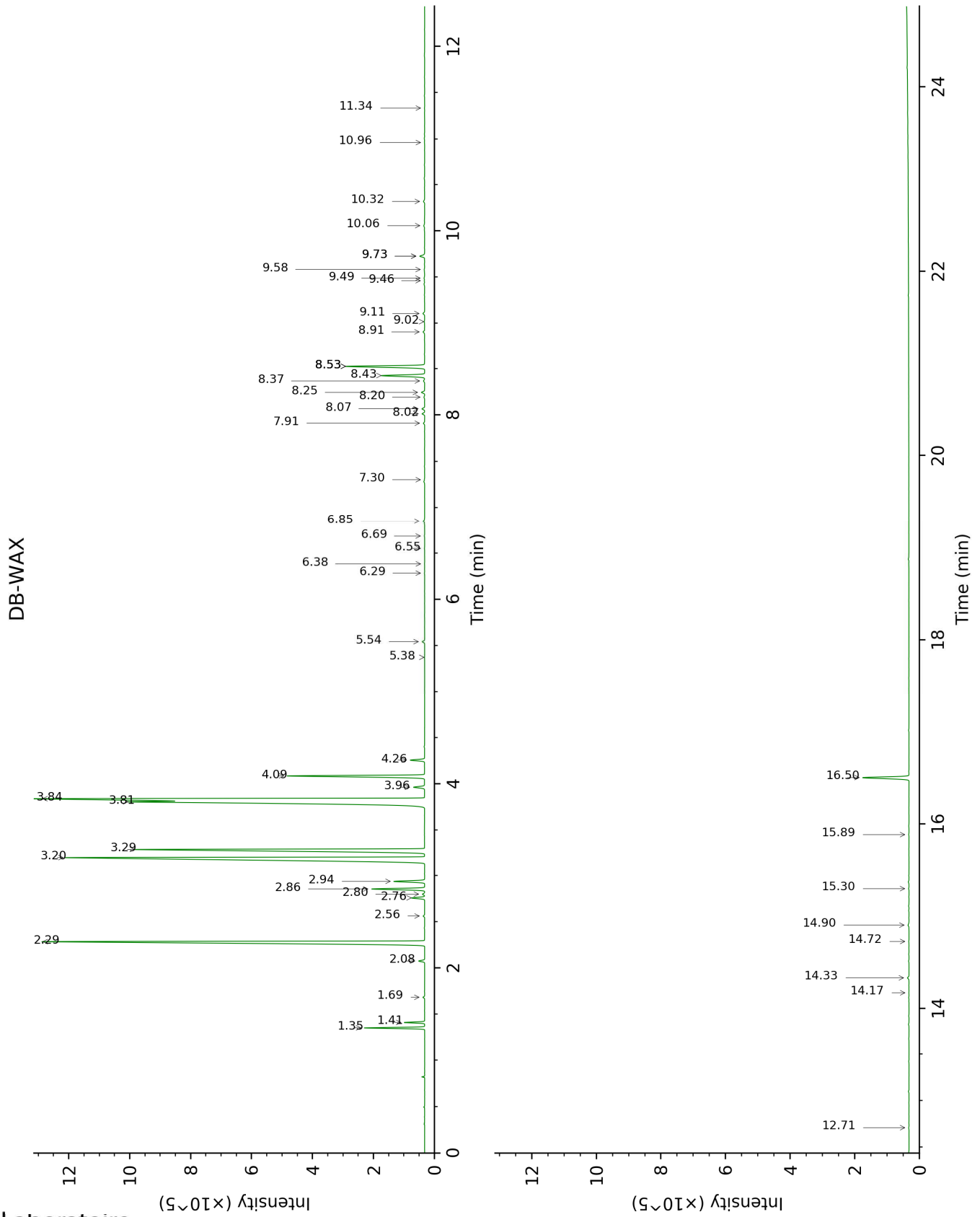
\*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

Note: no correction factor was applied

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
α-Isoamylene	0.36	498	0.06			
α-Thujene	2.91	924	0.47	1.41	1004	0.47
α-Pinene	2.98	929	1.46	1.35	994	1.46
Camphene	3.17	942	0.05	1.68	1031	0.05
β-Pinene	3.60*	971	16.33	2.08	1069	0.18
Sabinene	3.60*	971	[16.33]	2.29	1090	16.18
Myrcene	3.91	992	1.64	2.86	1137	1.64
α-Phellandrene	4.04*	1001	0.47	2.76	1130	0.40
Pseudolimonene	4.04*	1001	[0.47]	2.80	1133	0.07
Δ <sup>3</sup> -Carene	4.13	1006	0.04	2.56	1114	0.04
α-Terpinene	4.24	1014	0.98	2.94	1144	0.99
para-Cymene	4.37	1022	4.67	4.09	1231	4.71
Limonene	4.48*	1028	32.90	3.20	1164	20.34
1,8-Cineole	4.48*	1028	[32.90]	3.29	1171	12.53
(Z)-β-Ocimene	4.66	1040	5.65	3.81†	1210	32.04
(E)-β-Ocimene	4.81	1050	0.35	3.96	1222	0.36
γ-Terpinene	4.97	1060	26.32	3.84†	1213	[32.04]
cis-Sabinene hydrate	5.04	1064	0.06	6.85	1431	0.06
α-Pinene oxide analog	5.27	1079	0.01	5.38	1323	0.01
Terpinolene	5.37*	1085	0.45	4.26	1243	0.44
para-Cymenene	5.37*	1085	[0.45]	6.28	1389	0.01
trans-Sabinene hydrate	5.51	1094	0.04	7.91	1510	0.04
Linalool	5.61	1100	0.08	8.02	1518	0.08
cis-para-Menth-2-en-1-ol	5.87	1117	0.09	8.07	1522	0.09
allo-Ocimene	6.06*	1129	0.09	5.54	1336	0.08
cis-Limonene oxide	6.06*	1129	[0.09]	6.38	1396	0.01
cis-para-Mentha-2,8-dien-1-ol	6.09	1131	0.01	9.46	1632	0.01
trans-Limonene oxide	6.12	1133	0.02	6.55	1408	0.01
trans-para-Menth-2-en-1-ol	6.16	1136	0.06	8.91	1588	0.05
Epoxyterpinolene	6.23	1140	0.01	6.69	1418	0.01
1,4-Dimethyl-4-acetylcyclohexene	6.26	1142	0.01	7.30	1464	0.01
Terpinen-4-ol	6.75	1173	2.88	8.53*	1558	2.86
Cryptone	6.83	1179	0.06	9.11	1603	0.06
α-Terpineol	6.95	1187	0.15	9.73*	1654	0.19
cis-Piperitol	7.02	1191	0.04	9.49	1634	0.02
α-Phellandrene epoxide	7.10	1196	0.01	10.96	1757	0.01
trans-Piperitol	7.22	1204	0.04	10.32	1702	0.05
trans-Carveol	7.46*	1220	0.02	11.34	1788	0.01

Unknown [m/z 43, 119 (32), 97 (32), 41 (29), 71 (28), 58 (25)...]	7.46*	1220	[0.02]			
Thymol methyl ether analog I	7.59	1229	0.11	8.25	1536	0.11
Thymol methyl ether	7.66	1234	1.55	8.43	1550	1.54
Carvacrol methyl ether	7.79	1242	0.04	8.53*	1558	[2.86]
Unknown [m/z 43, 81 (62), 109 (51), 71 (40), 55 (26), 41 (25)...]	7.85	1246	0.01			
(2E)-Decenal	8.06	1260	0.01	9.02	1596	0.01
Geranial	8.18	1268	0.03	10.06	1680	0.04
Bornyl acetate	8.38	1282	0.03	8.20	1532	0.03
cis-Ascaridole glycol?	8.46	1287	0.02	14.72	2102	0.01
Cuminol	8.50	1290	0.01	14.17	2048	0.01
Thymol	8.62	1298	0.03	14.90	2120	0.04
Unknown [m/z 81, 137 (39), 43 (36), 95 (27), 69 (23), 79 (18)...]	8.70	1304	0.02			
Carvacrol	8.81	1311	0.02	15.30	2159	0.02
Unknown [m/z 139, 69 (45), 83 (38), 121 (34), 79 (29), 43 (27)...]	9.40	1353	0.01			
Unknown [m/z 139, 69 (53), 83 (42), 121 (39), 43 (30), 79 (28)...]	9.66	1371	0.01			
Unknown [m/z 159, 43 (68), 91 (57), 119 (52), 105 (51), 107 (42)...]	9.85	1384	0.04			
β-Caryophyllene	10.22	1411	0.05	8.37	1546	0.04
Aromadendrene	10.51	1433	0.01	8.53*	1558	[2.86]
γ-Murolene	11.01	1470	0.04	9.58	1642	0.02
Germacrene D	11.05	1474	0.04	9.73*	1654	[0.19]
Spathulenol	12.28	1569	0.05	14.33	2064	0.06
Caryophyllene oxide	12.34	1573	0.03	12.71	1911	0.01
Dill apiole	12.92	1619	1.74	16.50	2284	1.73
Germacra-4(15),5,10(14)-trien-1α-ol	13.60	1677	0.01	15.89	2220	0.01
<b>Total identified</b>		<b>99.32%</b>			<b>99.23%</b>	
<b>Total reported</b>		<b>99.41%</b>			<b>99.23%</b>	

\*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

†: Peaks apexes were resolved, but peaks overlapped and were summed for analysis

Note: no correction factor was applied

R.T.: Retention time (minutes)

R.I.: Retention index